

WHAT IS CLAIMED IS:

1. A picture encoding apparatus comprising:

memory means for writing and storing an input picture from one line to another;

wavelet transform means for applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

quantization means for quantizing wavelet transform coefficients obtained from said wavelet transform means; and

entropy encoding means for entropy encoding quantized coefficients from said quantization means when the number of samples of said quantization coefficients has reached the size required for entropy encoding;

said quantization means quantizing the wavelet transform coefficients, using at least one of weighting coefficients of a table provided at the outset for each sub-band generated on wavelet transform and weighting coefficients found from one block area picture forming a picture to another.

2. The picture encoding apparatus according to claim 1 wherein weighting coefficients of said table of said quantization means provided from the outset for each sub-band are such that, the larger the number of sub-band splitting stages, the larger become the weighting coefficients and the higher becomes the priority placed on the weighting coefficients, and conversely, the smaller the number of the splitting stages, the smaller become the weighting coefficients and the lower becomes the priority placed on the

weighting coefficients, and such that, in sub-bands of the same splitting stage, the weighting coefficients become smaller for the high range than for the low range to decrease the priority of the weighting coefficients.

3. The picture encoding apparatus according to claim 1 wherein quantization coefficients obtained from said quantization means are collected in terms of a block as a unit, and wherein, at a time point a given block is filled with quantization coefficients, entropy encoding is performed by said entropy encoding means.

4. The picture encoding apparatus according to claim 3 wherein said entropy encoding means resolve quantization coefficients in said block into bit planes composed of binary data and executes arithmetic encoding depending on the occurrence probability distribution of symbols in each bit plane, and wherein the estimation of said probability distribution is performed only on data in a predetermined block.

5. The picture encoding apparatus according to claim 1 wherein said input picture is split into a plurality of rectangular tiles and written in said memory means.

6. The picture encoding apparatus according to claim 1 wherein said input picture is a continuous picture of a plurality of frames and wherein the input continuous picture is sequentially encoded from one frame to another.

7. A picture encoding apparatus comprising:

memory means for writing and storing an input picture from one line to another;

wavelet transform means for applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the

number of lines required for wavelet transform;

quantization means for quantizing wavelet transform coefficients obtained from said wavelet transform means;

block picture analysis means for analyzing the motion information in a block picture and the degree of fineness of the texture for each block area in said input picture; and

entropy encoding means for entropy encoding quantized coefficients from said quantization means when the number of samples of said quantization coefficients has reached the size required for entropy encoding.

8. The picture encoding apparatus according to claim 7 further comprising:

means for computing weighting coefficients for quantization of said block picture area using the analysis information from said block picture analysis means.

9. The picture encoding apparatus according to claim 7 wherein said quantization means includes means for determining ultimate weighting coefficients for quantization using both sub-band based table weighting coefficients and weighting coefficients derived from said analysis information.

10. The picture encoding apparatus according to claim 9 wherein quantization coefficients obtained from said quantization means are collected in terms of a block as a unit, and wherein, at a time point a given block is filled with quantization coefficients, entropy encoding is performed by said entropy encoding means.

11. The picture encoding apparatus according to claim 10 wherein said entropy

encoding means resolve quantization coefficients in said block into bit planes composed of binary data and executes arithmetic encoding depending on the occurrence probability distribution of symbols in each bit plane, and wherein the estimation of said probability distribution is performed only on data in a predetermined block.

12. The picture encoding apparatus according to claim 7 wherein said input picture is split into a plurality of rectangular tiles and written in said memory means.

13. The picture encoding apparatus according to claim 7 wherein said input picture is a continuous picture of a plurality of frames and wherein the input continuous picture is sequentially encoded from one frame to another.

14. A picture encoding apparatus comprising:

memory means for writing and storing an input picture from one line to another;

wavelet transform means for applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

quantization means for quantizing wavelet transform coefficients obtained from said wavelet transform means; and

entropy encoding means for resolving quantization coefficients obtained from said quantization means into bit planes from MSB to LSB, shifting bit planes of a plurality of blocks present in the same sub-band by a pre-set number of bits, and entropy encoding the bit planes of sequentially entropy encoding blocks when the

number of samples of the shifted quantization coefficients has reached a pre-set magnitude.

15. The picture encoding apparatus according to claim 14 wherein said entropy encoding means includes means for performing entropy encoding after the end of bit shifting of blocks from sub-band division existing in an entropy encoding unit block in case the size of the block divided from a sub-band and existing in the sub-band is smaller than the entropy encoding unit block size.

16. The picture encoding apparatus according to claim 14 wherein said entropy encoding means includes means for performing encoding in the totality of entropy encoding unit blocks from sub-band division existing in a sub-band, after the end of bit shifting the block from sub-band division, in case the size of a block existing in the sub-band is larger than the entropy encoding unit block size.

17. The picture encoding apparatus according to claim 14 wherein said input picture is a continuous picture of a plurality of frames and wherein the input continuous picture is sequentially encoded from one frame to another.

18. A picture encoding apparatus comprising:

memory means for writing and storing an input picture from one line to another;

wavelet transform means for applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

quantization means for quantizing wavelet transform coefficients obtained from

said wavelet transform means; and

entropy encoding means for resolving quantization coefficients from said quantization means into bit planes from the MSB to the LSB and for entropy encoding the quantization coefficients when the number of samples of said quantization coefficients has reached a pre-set magnitude;

said entropy encoding means splitting and extracting fractional portions of the bit planes from the MSB to the LSB of a plurality of entropy encoding blocks existing in the same sub-band, encoding the extracted fractional bit planes from the MSB to the LSB and generating the fractional encoded bitstream corresponding to said fractional bit planes.

19. The picture encoding apparatus according to claim 18 wherein said entropy encoding means shifts the bit plane of a block from sub-band division, corresponding to a specified spatial picture area, a pre-set number of bits, and subsequently sequentially encodes the totality of the entropy encoding blocks existing in the one and the same sub-band from the MSB to the LSB from one bit plane to another.

20. The picture encoding apparatus according to claim 19 wherein the information of said specified spatial picture area is the motion information in a block picture or the analysis information supplied from analysis means for analyzing the fineness of the texture, from one block area picture forming a picture to another.

21. The picture encoding apparatus according to claim 20 wherein if said input picture is an interlaced picture, and an entropy encoding block is decided to exhibit vivid

motion by said analysis information, the bit plane of an entropy encoding block area is shifted by shift-up means.

22. The picture encoding apparatus according to claim 20 wherein if an entropy encoding block is decided to be a still area by said analysis information, the bit plane of an entropy encoding block area is shifted by shift-up means.

23. The picture encoding apparatus according to claim 18 wherein said entropy encoding means arrays said fractional encoded bitstreams from the lowest sub-band with the maximum number of splitting stages towards the highest sub-band with the minimum number of splitting areas to generate an ultimate encoded bitstream.

24. A picture encoding method comprising:

a storage step of writing and storing an input picture in memory means from one line to another;

a wavelet transform step of applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

a quantization step of quantizing wavelet transform coefficients obtained from said wavelet transform step; and

an entropy encoding step of entropy encoding quantized coefficients from said quantization step when the number of samples of said quantization coefficients has reached the size required for entropy encoding;

said quantization step quantizing the wavelet transform coefficients, using at

least one of weighting coefficients of a table provided at the outset for each sub-band generated on wavelet transform and weighting coefficients found from one block area picture forming a picture to another.

25. A picture encoding method comprising:

a storage step of writing and storing an input picture in memory means from one line to another;

a wavelet transform step of applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

a quantization step of quantizing wavelet transform coefficients obtained from said wavelet transform step;

a block picture analysis step of analyzing the motion information in a block picture and the degree of fineness of the texture for each block area in said input picture; and

an entropy encoding step of entropy encoding quantized coefficients from said quantization step when the number of samples of said quantization coefficients has reached the size required for entropy encoding.

26. A picture encoding method comprising:

a storage step of writing and storing an input picture in memory means from one line to another;

a wavelet transform step of applying wavelet transform in the horizontal and

vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

quantization step of quantizing wavelet transform coefficients obtained from said wavelet transform step; and

entropy encoding step of resolving quantization coefficients obtained from said quantization step into bit planes from MSB to LSB, shifting bit planes of a plurality of blocks present in the same sub-band by a pre-set number of bits, and entropy encoding the bit planes of sequentially entropy encoding blocks when the number of samples of the shifted quantization coefficients has reached a pre-set magnitude.

27. A picture encoding method comprising:

a storage step of writing and storing an input picture in memory means from one line to another;

a wavelet transform step of applying wavelet transform in the horizontal and vertical directions each time a picture stored in said memory means reaches the number of lines required for wavelet transform;

a quantization step of quantizing wavelet transform coefficients obtained from said wavelet transform step; and

an entropy encoding step of resolving quantization coefficients from said quantization step into bit planes from the MSB to the LSB and for entropy encoding the quantization coefficients when the number of samples of said quantization coefficients has reached a pre-set magnitude;

said entropy encoding step splitting and extracting fractional portions of the bit planes from the MSB to the LSB of a plurality of entropy encoding blocks existing in the same sub-band, encoding the extracted fractional bit planes from the MSB to the LSB and generating the fractional encoded bitstream corresponding to said fractional bit planes.